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A SKIASCOPIC PROCEDURE FOR VISUAL SCREENING SURVEYS*

Monroe J. Hirsch†
Los Angeles College of Optometry
Los Angeles, California

Despite the introduction of numerous techniques designed to enable an untrained person to conduct a visual screening survey, static skiametry is still the method of choice for the accurate and rapid determination of the refractive state. This is especially true when it is desirable to measure a large number of children on school premises in a limited time. The various devices which do not require the services of an optometrist fail to uncover moderate degrees of one or more of the following common refractive states: hypermetropia, astigmia, anisometropia or antimetropia. In the final analysis, these tests depend heavily upon visual acuity determinations to uncover the presence of myopia or astigmia and muscle balance tests to demonstrate the presence of hyperopia. The main advantage of such devices over the simpler, more direct, skiascopic determination seems to rest upon the apparent simplicity of the testing procedure, enabling nurses, receptionists, safety engineers and clerks to administer the survey, and presumably obviating the necessity of hiring personnel skilled in the use of customary clinical procedures.

Occasionally the optometrist is called upon to perform a visual screening survey. The technique here described is one suited for such occasions, and has been employed to determine refractive state of 4,300 children.* There are three desirable conditions in using static skiametry in school surveys. These are:

(a) Attention factor.

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†Optometrist. Ph.D. Member of faculty. Fellow, American Academy of Optometry.

*3,127 children were examined during 1947-8 by the author while conducting surveys in 13 schools in the vicinity of Columbus, Ohio; 1,200 children were examined during 1949 by the author and members of the staff of the L. A. C. O. at Puente, California.

(b) Accommodative relaxation.

(c) Availability of a sufficient number of lens combinations to determine the refractive state of the eye.

The technique here described grew out of a need to obtain these conditions.

METHOD. The child is seated six meters from a beaded screen on which is projected a motion picture cartoon. The film was selected to obtain material which would engage the interest of the children and also which had as little fine detail as possible. The use of the motion picture for a fixation target satisfied condition *a*, above.

When the child entered the room, an assistant placed a pair of +1.50 D. spherical lenses mounted in a metal spectacle frame before his eyes. The child was allowed to watch the movie for a few minutes through these plus lenses. Since the child desired to see the target and since he was doing so through "fogging" lenses, it was felt that accommodative relaxation was obtained, satisfying condition *b*, above.

The examiner used a retinoscope and a bar containing 10 lenses: —0.25 to —1.25 and +0.25 to +1.25 in 0.25 D.S. steps. If the refractive error was greater than the powers obtainable by the use of these lenses, the +1.50 D.S., which the child was wearing, was replaced by a pair of lenses of a more appropriate power. The use of glasses which the child wore and the 10 lens bar gave all needed combination and met condition *c*, above.

Essentially the procedure consisted of having the child watch a motion picture with one eye through plus lenses while the examiner using a set of auxiliary lenses performed skiametry on the other eye. A number of minor suggestions of a practical nature might be offered. Clearly, there are many ways in which the test could be performed and numerous variations could be devised. The following suggestions merely report some of the minor difficulties which were solved in past surveys.

(a) A 16 mm. projector was used and the problem of frequent re-winding was met in two different ways. Certain projectors have a variable speed and the film can be run quite slowly. Certain projectors also can run the film in reverse. It was found that many of the cartoons are equally interesting whether they are run forward or backward. This completely obviated the necessity of re-winding. Also it is possible to splice together four 400 foot reels resulting in a running time of almost an hour. For projectors with no reverse, this was found to be satisfactory since only four or five re-windings per day were necessary.

(b) In all of these surveys either mothers or older students were

available as clerks. It was found to be satisfactory to have one such assistant place the lenses on the child as he entered the screening area. About 10 pairs of glasses were available so that a number of children could be waiting for the examiner at all times. This had the advantage of obtaining good accommodative relaxation, since the child watched the screen through the fogging lenses for a few minutes before the skiametry was performed. Where space was available, it was found to be highly satisfactory to have six children seated facing the screen. The examiner, using a stool on casters, moved from one subject to the other along the line. As soon as he completed retinoscopy, the assistant placed in the line a new child who then watched the movie while the examiner went on down the line.

(c) Metal frames with 20 mm. bridge and 40 mm. eye wire were found to be a satisfactory average size. Since the examiner worked at 67 cm. the +1.50 D.S. lens represented the working distance. With the bar described and +1.50 D.S. on the child, a range of +1.25 to −1.25 was obtained. If the child had a refractive error greater than this, the +1.50 D.S. lenses were replaced by a pair of −1.50 D.S. (for myopia more than 1.25) or +4.50 D.S. (for hypermetropia more than 1.25 D.S.)

The examinations made by the author were designed to give usable data on refractive state as well as to determine which children needed further attention. For this reason, the power in the two major meridians was estimated to the nearest 0.25 D. However, this degree of accuracy is not necessary if the results are to be used merely for screening purposes. Also, it is not necessary to determine the exact refractive state above a certain degree. Insofar as screening is concerned, it is of academic interest only to determine whether 1 diopter or 5 diopters of myopia is present. Therefore lenses of different power (half diopter steps) could be used in the bar, obviating the necessity of glasses other than the +1.50 D.S.

DISCUSSION. The method described is quite rapid, enabling an optometrist to determine the refractive state of between 200 and 300 children in a school day. By the use of "fogging" lenses, it is evident that the accommodation is relaxed adequately to give usable results. In Figure 1, the average refractive state for children between the ages of 6 and 14 is given. As is well known the average refraction decreases from about 1.00 D. of hyperopia at age 6 to 7 to about 0.50 D. at the period of adolescence.* The circles represent the finding on 3,127

*Both of these studies utilized random sampling. Results cannot be compared to those obtained in clinic or private practice.

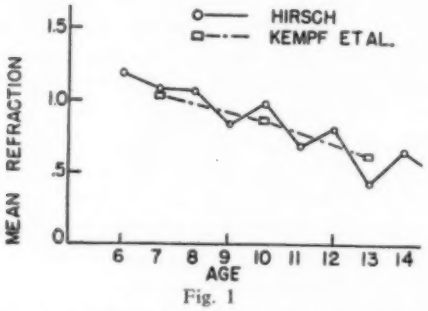

Fig. 1

children in the Ohio schools using the technique here described. The squares represent findings of Kempf, Jarman and Collins[1] on 1,860 school children in Washington, D. C. These latter measurements were made by skiametry and under cycloplegic. The close agreement of the results obtained by Hirsch using the method of accommodative relaxation here described and these authors with cycloplegic would seem to indicate that for the average, as much relaxation is obtained by this method as by the use of cycloplegia. Numerous authors have in the past, pointed out the impracticability of cycloplegics in visual surveys of children. The method here described seemingly obviates the necessity for the use of cycloplegics while giving the benefits usually attributed to such drugs.

The advantage of the method here described in enabling a rapid and accurate determination of astigmatism and hyperopia need only be mentioned in passing. Astigmatic errors of moderate degree cannot be determined with any certainty either through the use of the Snellen chart, or through the use of the more complex screening devices. It should also be emphasized here that the foregoing article is not to be construed as a suggestion for the use of skiametry alone in visual surveys. The data to be found through the use of the Snellen chart are essential, for example, in cases of amblyopia. Similarly the numerous tests which might be performed to determine muscular imbalances are a necessary part of any visual screening survey, while the ophthalmoscope is necessary to determine the presence or absence of pathology. However, it is stressed that none of the complex devices now in use is in any way a substitute for the professionally trained optometrist, and the retinoscope when used by such a person yields valuable information not made available by any other procedure.

[1]Kempf, Grover A., S. D. Collins, B. L. Jarman, Refractive Errors in the Eyes of Children as Determined by Retinoscopic Examination With a Cycloplegic. Public Health Bulletin No. 182, U. S. Govt. Ptg. Office, Washington, 1928.

SUMMARY. The use of static skiametry offers a rapid and accurate method of determining refractive state in school survey work. The method here described utilizes a motion picture and fogging lenses to obtain fixation and accommodative relaxation. The results are similar to those obtained by the use of cycloplegia and the method therefore attains the same end without the disadvantages involved in the use of drugs.

ABSTRACTS

TRIFOCALS, FITTING POSSIBILITIES AND PROBLEMS. H. Berenholtz. The Optical Journal and Review of Optometry. Part I. 87.19.31-34. 1950. PART II. 87.20.33-35. 1950.

Part I. Following a brief review of commercially practical trifocals and a few statements relative to the need for trifocals in various vocational and professional pursuits, the author describes a method of "bringing about patient acceptance" of trifocals.

A desk calendar, cards or sheets of music are placed upon a desk three or four feet from the patient. The distance ametropic correction is inserted in a trial frame and if the patient requires an add of 1.75 D.S. (or more), it is demonstrated that the material across the desk is blurred. The reading correction is then inserted and it is pointed out that both the distance vision and the material on the desk are blurred while reading matter held at the normal reading distance is clear.

Finally, an intermediate correction is placed in the trial frame and the patient observes the material at 3 or 4 feet is clear while the distance vision and reading matter at the usual distance is blurred. In this way, it is demonstrated that three ranges of foci are necessary for most comfort and efficient vision and it is explained that trifocals are the only means of obtaining such corrections. The demonstration is augmented by adding to the distance correction in the trial frame, a pair of trifocal trial case lenses having plano uppers with the appropriate near and intermediate corrections. The patient is able to observe that he may have clear distance, intermediate and near vision without changing glasses.

The use of the Hutchinson presbyopic chart is also described. The author stresses that a careful explanation to the patient of the advantages and limitations of trifocals will do much to obviate subsequent difficulties.

Part II. The author states that trifocals are easier to adapt to than bifocals because the former provide a more gradual increase in change of focus as the patient looks from far to near. It is also pointed out that the matter of "jump" is less of a problem in trifocals as compared to bifocals.

Some of the salient characteristics of the various available trifocal lenses are listed and the advantages and limitations of various size segments are discussed.

Reference is made to the increasing average age of the population as noted in an article from the *Monthly Labor Review* which points out that if recent trends continue the number of aged will more than double before the end of the twentieth century. According to the author, this means that a very large proportion of many ophthalmic practices will be concerned with the care of this older group likely to benefit by a trifocal correction.

R. E. B.

THE RELATION OF LIGHT TO SAFETY*

H. L. Logan†
New York, New York

The causes of accidents are many, but looming large among them is uncertain sight. This cause is not given its proper weight in any of the many statistical studies that have been made because it is hidden under mountains of reports dealing with "flying particles," "falling objects," "striking stationary objects," "falls," "contact with moving machinery," etc. It is hidden because it is the cause behind the cause.

TABLE I
ACCIDENT CAUSES
From National Safety Council Data

	Relative Importance	Percentage	Accident Causes	Suggestions for Corrective Action
The worker	1	30	Lack of knowledge or skill	Job analysis Job training
	2	20	Unsafe procedure Unsafe Housekeeping Bodily defects	Formulation of safe procedure. Supervision discipline. Physical examinations.
	3	19.1	Improper attitude	Supervision discipline. Personnel work to remove worry.
The worker's environment	4	13.1	Agencies defective through use or design	Inspection. Proper maintenance
	5	9.5	Unsafe dress	Specify proper dress and equipment.
	6	5.6	Improper guards	Inspection design with guards.
	7	1.8	Unsafe housekeeping facilities	Supervision discipline. Job analysis; training.
	8	0.5	Improper ventilation	Improve ventilation
	9	0.4	Improper illumination	Improve illumination

The National Safety Council assigns 70 per cent of all accidents to the one third of the causes regarded as "personal" and only 30 per cent to the two thirds of the causes that lie within the influence of the worker's environment. One of the six environmental causes, "improper illumination" (more inclusively, uncertain sight), is judged responsible for only four tenths of one per cent of industrial accidents.

Uncertain sight may be caused by poor sight, poor light or a combination of both. Whatever the reason, the change in peripheral stimulus pattern in the field of view that accompanies a developing

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†Vice President in Charge of Applied Research, The Holophane Company, Inc., 342 Madison Ave., New York 17, New York.

hazard does not rise sufficiently above the threshold to initiate the necessary protective reflex, or it rises too late.

The types of environmental stimulus patterns, or lighting distributions, that will insure optimum physiological alertness can only be understood in the light of the facts about *how the eyes work*, and the features of the natural environment *in which they work*. These facts are now set forth briefly. "As long as there has been life that *moved* there has been a means of perceiving light." Stationary forms of life have no eyes. Plants have no eyes and do not need them. Eyes became necessary to the survival of life when life *began to move*. When life moves, it exposes itself to hazards and a varying food supply, so it becomes necessary for moving forms of life to have a means of recognizing the dangers and benefits in the environment. An organ that will respond to *light* is this means.

Primitive light responsive organs (Figure 1) accept light unselec-

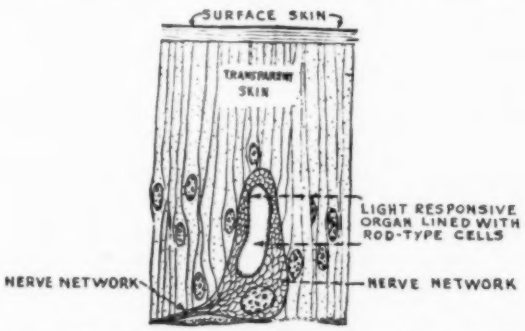

Fig. 1. Section through transparent skin of earthworm illustrating light-responsive mechanism.

tively from any direction and so the animal possessing them has only the vaguest sort of vision, "consisting of a general, patternless sensation of light." It cannot "see," as we understand the term, but the impulses set up by light in the network of nerves leading from these light-responsive organs go to the muscles of the animal, causing reflex actions.

This mechanism—*a means of receiving light stimuli—a means of changing the light into a nerve impulse—a direct tie-in of these nerves with the animal's muscles*—is the means adopted by nature to automatically ensure a safe or beneficial response of the animal to its environment. Thus "eyes" began as "automatic" safety devices to insure survival.

HUMAN EYES

Human eyes retain this physiological function of all earlier eyes with the added function of vision. (Figure 2). There are two types of light receptors in human eyes—*rods* and *cones*. The cones are principally packed into a tiny space in the central region of the retina

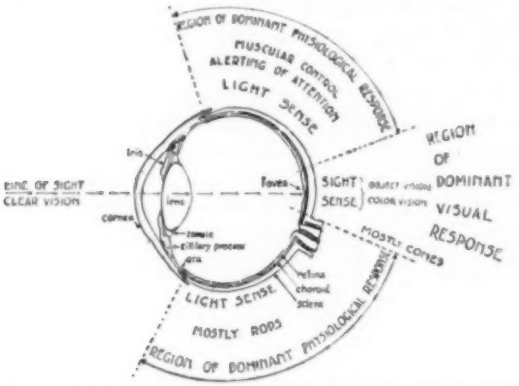

Fig. 2. Section through human eye illustrating areas of dominant visual response and dominant physiological response.

called the *fovea* (see diagram above). We see with the fovea. Man has a *line of sight* which must connect the object he wants to see with the fovea, through the lens. He only sees clearly along his line of sight.

Look at a sheet of single spaced typing. You cannot read the words in the third line above or below your line of sight unless you move your eyes the short distance necessary to look directly at the words.

The rods, which are 95 per cent of the light receptors in human eyes, possess a tie-in with the "motor" system of the body as in earlier forms of life, and they initiate automatic or reflex actions. They affect the posturing and orientation of the individual with respect to light stimuli in his environment, and enable him to move with safety through space.

The importance of peripheral stimulus patterns similar to optimum natural patterns in automatically creating safe orienting and posturing movements of the individual has been overlooked.

NATURAL LIGHTING CONDITIONS

How can lighting be designed to meet the needs of the total eye, instead of the visual capacity of the "cones" only? The answer can be found through an examination of natural conditions.

Man is a creature of his natural environment, just as are all other

forms of life. He can maintain health and vigor only as long as he lives in a natural environment to which he is *adapted*, or as long as he *controls* his artificial environment with his inventions to keep external stimuli within the range of his adaption.

Man is naturally adapted to an external temperature of 70° F. ±5°. He therefore controls his indoor climate by means of his invention of *artificial heating* to keep temperature within this range.

Man is likewise adapted to a range of natural luminous conditions and his visual efficiency, comfort and safety are at a maximum when he stays within this natural range.

Man's response to the manner of *distribution* of the light in the total field of view is critical, and assuming a moderate, but adequate, amount of light to start with, the distribution of that light becomes the most important feature in design.

The optimum range of variations in the distribution of light in the natural field of view is shown in Figure 3.

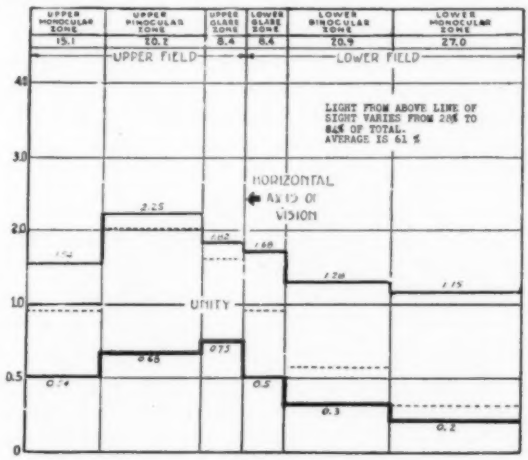

Fig. 3.

The two heavy lines that cross this diagram can be considered guide lines in the design of artificial lighting systems for safe environments. When the distribution of light in an artificial system falls between these lines, safe and efficient physiological responses can be expected because it will be a distribution within the optimum range of human adaptation.

There is not space in this article to explain how this diagram is used in the design of safe luminous environments. Readers interested in fol-

lowing this matter farther are referred to the papers by the author, "Light for Living" and "The Practical Mechanics of Designing Optimum Lighting Patterns" in the March, 1947, and December, 1948, issues of ILLUMINATING ENGINEERING.

FUNCTION OF LINE OF SIGHT

The ability of human beings to "see" is but one of the processes set into action by the eyes. Man is prone to recognize it as the only one, because it is the function that has enabled him to develop a civilization and to engage in cultural activities, but his individual safety and well-being remain closely dependent upon the light pattern that reaches his eyes from the entire field of view, rather than upon the stimulus received from the objects he can see clearly along his line of sight. If this light pattern, or a person's ability to react to it appropriately, is defective, that person is potentially unsafe, or accident-prone, in that environment.

PHYSIOLOGICALLY SAFE LIGHTING

Emphasis on the use of the eyes as visual organs only has led to the use of light in industry for seeing only, to the involuntary neglect of the need for physiologically safe lighting conditions; and it is this same preoccupation with eyes as "seeing tools" that has delayed a full recognition of the major role that proper lighting can play in safeguarding all human activities.

QUANTITY OF LIGHT

Until the present time safety levels of lighting have been considered to be the least light necessary for seeing in the judgment of an observer who made a leisurely survey of a particular site. However, such a test does not take cognizance of the workman who trips over something. The foreman puts the accident down to a personal cause—carelessness—not realizing that, although there was enough light for the workman to have seen the bar (Figure 4) if he had studied the floor, there was not sufficient light to attract his attention to the bar in

Fig. 4. (Left) Rod on floor barely visible. (Right) Rod visible. Photograph, Westinghouse Electric & Manufacturing Company.

time to prevent his stumbling over it at the normal speed at which the workman should and did move.

The old proverb, "Look before you leap," is sound advice, but it is no help in the dark, and a workman is always moving into physiological darkness when he moves from the relatively high level of bright-

Fig. 5. A person is always moving into "darkness" when he moves from the well lighted work area into a lower surrounding level. It takes 60 times longer for eyes to adapt to a lower brightness than it does to a corresponding higher level.

ness of his work into a surrounding level to which his eyes are not adapted. It must be remembered that it takes 60 times longer to adapt eyes to a lower level of brightness than to a corresponding higher level.

There is not time in modern high-speed industry to make these

Fig. 6. This floor patch appeared as a "wetness patch." Several times as much light was required to reveal it in its true nature, and danger, as an oil-slick.

downward adaptations; but, when they are not made, and an accident happens, the workman is charged with carelessness instead of the management's being charged with failure to make the proper environmental adjustment to elementary physiological facts.

UNCERTAIN SIGHT CAUSES ACCIDENTS

1. When there is not sufficient light to reveal the hazard clearly.
2. When the level of illumination, although good for leisurely observation, is not enough to force the observer's attention to the hazard under normal conditions of speed and preoccupation of the observer.
3. When the hazard is camouflaged by brightness, such as glare or by color which might give it the same brightness as the background and so conceal it, or by shadow which might hide the hazard.
4. When the eyes are defective. Defective eyes benefit from proper lighting, but the best light will not compensate for inherent eye defects. Such eyes should be corrected to normal.

RELATIONSHIP BETWEEN LIGHT AND ACCIDENTS

What proof is there that accidents caused by improper lighting are a major group? First, there is the general proof of the paramount part played by sight as the major sense. Most authorities agree that more than 85 per cent of our activities are controlled by sight and the remaining 15 per cent by the other four senses. Therefore, if accident causes were classified in relation to the senses involved, "sight" would appear in 85 per cent of the cases. This is inevitable in view of the reflex control of the motor system of the body through the stimulus patterns on the retina.

A statistical study shows that 22 per cent of industrial accidents happen to the fingers (Figure 7). The implication is strong that, in

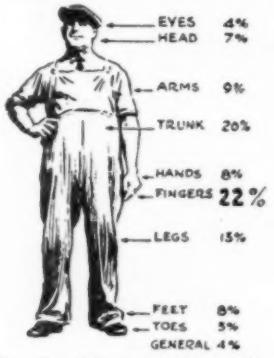

Fig. 7. Where accidents strike.

the absence of sufficient illumination, many workers are forced to rely unduly on their sense of touch.

Accidents in homes are twice as great as accidents in industry, added to accidents in traffic, plus war casualties. Reason—homes are notoriously underlighted. Of the approximate 5,000,000 which occur in homes annually 21 per cent of these occur on the porch and outside steps—the two most poorly lighted locations throughout the major portion of each 24 hours most of the year. Another 12 per cent occur in the halls, which also usually are underlighted. The kitchen claims 18 per cent. This is often the best-lighted part of the home, but when the kind of operations that are performed in the kitchen are compared with their counterparts in industry it will be found that the kitchen is poorly lighted for the work done there. Average kitchen illumination is five foot-candles for work that industry lights to 20 foot-candles, and more recently to 50 foot-candles. In short, at least 50 per cent of home accidents occur in locations that lighting engineers know to be invariably underlighted.

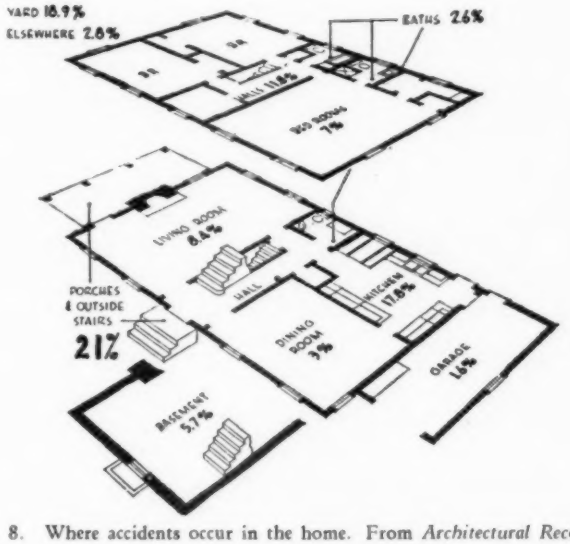

Fig. 8. Where accidents occur in the home. From *Architectural Record*.

The most striking proof lies in traffic-accident experience. For example, a traffic survey in Trenton, New Jersey, early in 1937 uncovered a relatively high percentage of night accidents, with a considerably higher incidence at 33 intersections. At these intersections

night accidents were 59 per cent of the total, while in the city as a whole only 42 per cent of all accidents occurred at night. These intersections were then scientifically lighted. Injuries decreased 40 per cent and fatalities 50 per cent at night. The economic loss owing to the night-traffic accidents at the 33 locations before improvement was $89,900.00. After improvements the loss was $52,700.00. The improvement cost $3,292.00 per year, proving once again that it costs less to prevent accidents than to pay for them.

The relationship between light and accidents is clearly indicated in the traffic figures of the borough of Manhattan, New York. There were 118 daytime fatal crashes in 1941 and 151 fatal crashes at night, despite the smaller traffic load at night. In 1942 under dim-out conditions, although daytime fatal crashes dropped to 86 owing to fewer cars on the streets, fatal crashes at night jumped to 254.

During the dim-out period of the war, night-traffic accidents in six of the principal communities of Connecticut increased 56.7 per cent over the rate in the same communities when normal street lighting was used.

Detroit had 96 fatal night time crashes on 100 miles of its streets selected for special study during the two years of 1935-36. Street lighting was scientifically improved on these streets in 1937. The total fatal crashes by night for the succeeding three years numbered 34. Examples of this kind can be cited indefinitely.

The objection has been raised that traffic-accident experience has no bearing on industrial-accident experience. The answer is that the eyes are obeying the same light stimulus, whether in night traffic, or in the factory, and are operating under the same physical and physiological laws. It is true that there are fewer complicating factors in analyzing traffic accidents so that the influence of lighting is more readily revealed. However, the underlying biological facts leave no room for doubting the fact that faulty illumination is the crux of both the industrial and traffic-safety problem.

Moreover, since the writer first published a tentative curve, Figure 9, relating the accident rate to the adaptation brightness of the field of view, a number of industrial cases have been recorded in the February, 1944, ILLUMINATING ENGINEERING, which show specific reductions in accident rates in 14 industries as a result of the application of scientific lighting principles.

E. E. Dorting of the Board of Transportation of the City of New York showed in the September, 1943, ILLUMINATING ENGINEERING the results of five years' research into the effect of lighting conditions

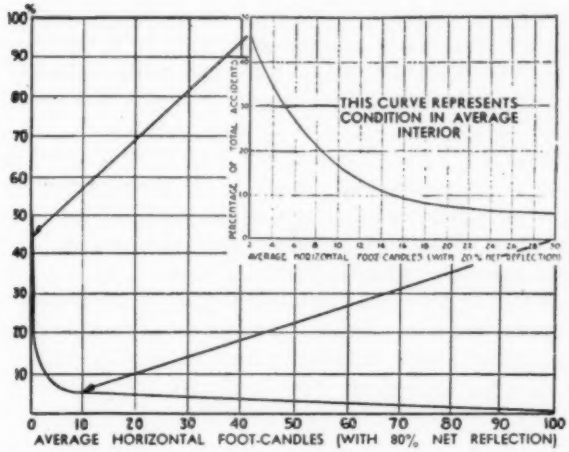
THIS CURVE REPRESENTS CONDITION IN AVERAGE INTERIOR
PERCENTAGE OF TOTAL ACCIDENTS
AVERAGE HORIZONTAL FOOT-CANDLES (WITH 80% NET REFLECTION)

Fig. 9. Accidents attributable to lighting causes shown as a percentage of total accidents over the range in which lighting conditions are a cause, for white interiors.

on the accident rate on stairways and at transfer points (getting on and off cars), in New York subways. He found a drop of 59 per cent in stairway accidents and 52 per cent in transfer-point accidents as a result of suitably raising the illumination at these places. His results check the curve referred to, because his before- and after-brightness, applied to the curve, give accident-rate decreases similar to those found in practice.

As the rate of accidents caused by insufficient lighting depends not only upon the mean brightness of the field of view (or the adaptation brightness) but also upon the distribution of the brightness in the field, it can be affected by the reflection factors of the field of view. For instance, a black interior with 600 foot-candles of illumination would have the same light-accident rate (other things being equal), as a white interior with only eight foot-candles. The eye works with the light it receives, not with the light sent out by the lighting fixtures. This is the underlying reason for the increasing popularity of the scientific painting of machines and industrial interiors.

The lower the level of illumination the more important is this matter of lighter scientific finishes. If an illumination of 15 foot-candles was being used the portion of the accident rate dependent upon uncertain seeing would tend to be 150 per cent higher with 10 per cent reflection factor than with 20 per cent. That is, accidents caused by improper

illumination would tend to be 10 per cent of all accidents with the higher reflection factor and 25 per cent with the lower, and so this matter of the proper application of paint and other surface finishes to the whole field of the view of the worker is highly important in accident control.

Another matter of great importance is the relation of design levels of illumination to actual in-service levels. Experience shows that in-service levels are more likely to run 40 per cent of the design levels rather than 70 or 80 per cent (figures customarily used by industry and lighting engineers in computing lighting levels).

The failure to look the facts in the face and realistically design lighting installations has a bearing on the accident rate. Suppose an industrialist wants a safe installation and so sets the minimum field brightness at the required six foot-lamberts (for average industrial interiors); suppose also the average absorption of the field of view is

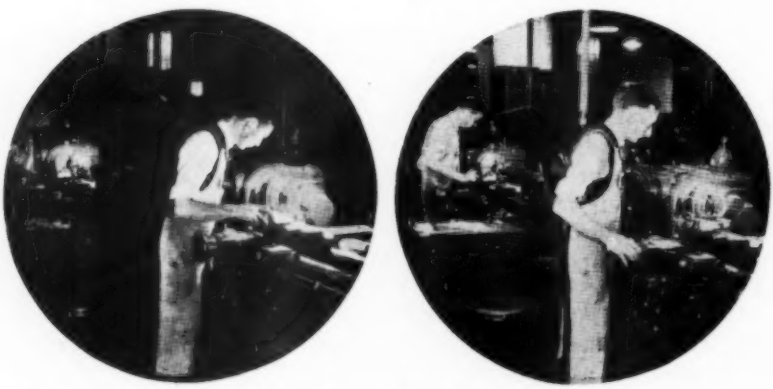

Fig. 10. (Left) Unsafe practice, work lighted only. (Right) Safe practice, work and surroundings lighted.

the usual 80 per cent. If a 25 per cent depreciation factor is optimistically assumed, a design level of 40 foot-candles will be adopted. Experience will then show the brightness level to be three foot-lamberts instead of six and the accident caused by improper illumination 50 per cent higher than they would have been if the six foot-lamberts actually had been realized. Such a mistake could have fatal results for one or more of the workmen and would be sure to cost the industrialist far more than he would save in the lower lighting cost.

Another point to watch in planning lighting for safety is to see that the work is at least as bright as the surround. If the general

interior is brighter than the work, visibility goes down, and, if it is less than 40 per cent as bright as the work, visibility also goes down. It goes down faster for an overbright surround than for an underbright surround. Then, too, the light must be carefully controlled at the source to prevent the adverse conditions of too bright a surround (too much light sent to the surround), too dark a surround (not enough light sent to the surround) and interception. Figure 10 illustrates the principle involved in designing lighting to avoid interception losses.

In conclusion, the following program is desirable:

1. To see that all workers have normal vision; either because they have good eyes anyway, or by correcting them to normal means (eyeglasses, treatments, etc.)
2. To provide safe levels of illumination (which are variable, depending upon the natural hazards of the work, but in the main are from 30 foot-candles up.)
3. To provide proper distribution of the light so that the effective foot-candles are as high a proportion of the actual foot-candles delivered and paid for, as possible.
4. To provide proper reflecting and contrasting finishes to all work surfaces, backgrounds and work interiors.
5. To provide continuous and conscientious maintenance.

ABSTRACTS

CHANGES IN PERFORMANCE AND IN OCULAR FUNCTIONS RESULTING FROM STRENUOUS VISUAL INSPECTION. J. Brozek, E. Simonson and A. Keys. American Journal of Psychology. 63.1.51-66. 1950.

The experiment described consisted of having six experienced male subjects identify small moving letters under inadequate illumination for a maximum period of 4 hours.

The proportion of letters recognized correctly decreased with a decrease in illumination and with the time spent at the task. The lower the illumination, the greater the decrease in accuracy with time.

No significant increase in the blinking rate was found. No significant changes were found in the measurements of abduction, positive vertical divergence, or the near-point. Flicker fusion fell slightly after 2 hours, and markedly after 4 hours work. The near point of convergence showed a highly significant deterioration as did the rate and precision of voluntary horizontal eye movements. In general, the subjects complained of marked difficulty in focusing and in maintaining fixation.

R. E. B.

A REPORT ON HAIDINGER BRUSHES*

Edgar J. Gording†
Windber, Pennsylvania

When an evenly illuminated surface is viewed through a nicol prism or any other type of polarizer, a peculiar effect is seen, called Haidinger's Brushes. Two sets of yellow brushes are seen meeting end on end rotating outward from the center. This phenomenon has been seen by many men since first discovery by Haidinger[1] in 1844.

Since Helmholtz's[2] description, the textbooks have merely quoted him or made reference to his work. Not until 1941 did the brushes receive any real investigation when work was done by Cogan.[3] Cogan postulated that the brushes are due to the interference pattern in the crystalline lens. He perceived that a crystalline lens placed in a solution and illuminated with polarized light reproduced the brush pattern.

It can only be deduced that Cogan was misled by appearances, for the lens theory has been disproved by the author in the following manner: An instrument set up in the manner described by Goldschmidt[4] was shown to a patient. Patient had recently undergone enucleation of the right eye and had the crystalline lens removed in the left eye. This patient was able to see the brushes with no difficulty. Three other aphakic patients were tested as to their ability to see the brushes and in every case there was immediate success. A check method changing the direction of rotation was used to insure that the patients saw the brushes and not some imagined phenomenon: the check procedure corroborated the patient's reports. If these patients were able to see the brushes with ease although they lacked their crystalline lenses, it can be said, therefore, that the crystalline lens plays no part in the formation of the Haidinger Brush.

It has been noted since the original discovery of the phenomenon that the brushes appear in diffused blue light and consequently the sky makes an excellent viewing screen. It has also been reported that a cobalt blue glass changes the appearance of the brushes causing them to appear as a shadowy purple instead of a dark yellow. Movement

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†Optometrist. Fellow, American Academy of Optometry.

also helps in viewing the brushes to insure that retinal adaptation does not occur. In the investigations conducted by the author, the brushes were viewed with and without the cobalt blue. It should be reported here, however, that the brush phenomenon can be elicited with magenta, purple, cyan, and blue filters. These filters producing the effect were made on vectograph film by using dichroic dyes and printing directly on the polaroid film.

When the brushes are viewed through a polarizer alone they appear as two distinct sets, yellow and blue, at right angles to each other. The form of the brushes is as two sheaves of wheat placed end to end, the blue brushes at right angles to the yellow ones. The yellow is a deep yellow while the blue is a pale blue, less in intensity than the sky when the sky is the viewing screen. It was at first thought that the entire area between the finger extensions of the yellow brushes appeared as a separate blue, but careful examination reveals that this is not so: there are two distinct sets of brushes at right angles to each other.

When the present investigation was begun, it was thought that the Haidinger Brushes were an independent phenomenon. Helmholtz[2] writes that he, Maxwell, Brewster,[5] and Silberman[6] agree that the extent of the brushes appears to coincide with the extent of the yellow spot. Helmholtz also has a drawing of the brushes which has been referred to in most modern textbooks. The drawing shows the brushes vertical when the plane of polarization is vertical. It can be said here that the brushes do not appear so. The brushes appear not in the meridian of polarization but in the meridian of absorption.

Tschernak-Seysenegg[7] states that the brushes appear in the meridian of absorption and this was demonstrated by the author as follows: The author took a split field polarizer, one field marked with the meridian of absorption, the other field marked with the meridian of polarization. On viewing the sky, the brushes appeared in both fields. The brushes appeared at right angles to the marker showing the meridian of polarization, and parallel to the marker showing the meridian of absorption., With the fact that the brushes appeared in the meridian of absorption established, it became apparent that the brushes did not appear because of the polarization but merely took their present form as a residue of the polarizing effect.

Another point of interest was that the author seemed to see the brushes in the sky without a polarizer. At first this was attributed to after-images, fatigue, and so on, but the image persisted. With practice

it became increasingly easier to see the brushes in the sky and reflected in objects, thus emphasizing the fact that given sufficient illumination and any slight polarization, the brushes could become apparent.

It was at this point that the resemblance of the brushes to the "yellow spot" became apparent. The yellow spot is a phenomenon that can be seen when looking at a blue sky or a surface uniformly illuminated with blue light. The yellow spot appears as a yellow blur at the point of fixation but after careful study is seen as a series of lines radiating from a common center. Helmholtz[2] described the yellow spot as a "dahlia."

The yellow spot can be seen in light that is incompletely polarized, such as reflected light, or light from a polarizing sky. It is more easily seen in the north sky on bright sunny days than on dark dreary days.

The yellow spot appears as a yellow blur. Now if a cobalt blue glass is placed in front of the fixating eye, there is a dark shadow where the yellow figure existed. If now, the blue glass is removed quickly, the yellow spot appears as a bright after-image in a slightly darkened sky. If this is repeated quickly, the yellow spot begins to take on the form that has been described by Helmholtz,[2] "When the fovea centralis appears very distinct the writer (Helmholtz) can detect in the non-vascular halo faint patterns of lines like the contours of a flower with many petals (for example, a Georgina or Dahlia)."

The possibility that the Haidinger Brushes were the residue and not the result of polarization was confirmed when it was discovered that the yellow brushes appear in the meridian of absorption and not in the meridian of polarization. It became increasingly clear, therefore, that something must have been obliterated by the polarizer and that the yellow brushes remaining are not polarized. If the sky is viewed and the polarizer rotated, we can see the apparent rotation of the object: but what we actually see is the brush created by the polarizer at different successive points as the plane of polarization rotates, and the successive brushes appear to move because of a stroboscopic effect. The origin of the blue brushes now becomes apparent. They are the blue residue of complete polarization. Crossed polarizers allow faint blue light to pass through and the brushes seen in the meridian of polarization are a very light blue.

Q. E. D. The Haidinger Brushes are the residue of the yellow spot after polarization. A table of comparisons between the two can be made to show their similarity.

Yellow Spot	*Haidinger Brushes*
1. Yellow principal color.	1. Yellow principal color.
2. Can be seen only in blue light.	2. Can be seen in blue light (the colored polaroid filters are an exception).
3. Entoptic phenomenon.	3. Entoptic phenomenon.
4. Seen in partially polarized light.	4. Seen in completely polarized light.
5. Easier to see with cobalt blue glass in motion.	5. Easier to see with cobalt blue glass in motion.
6. Round center with radiating lines.	6. Round center with radiating lines.
7. Lines radiate in all directions.	7. Lines radiate in meridian of absorption only.

The list could be extended, but it merely shows that the Haidinger Brush represents the yellow spot after a hyperbolic cutting of the sides has occurred.

If the yellow spot is diagrammed, we have as follows: (Figure 1) The center represents the fovea, the spokes represent the birefracting nerve fibers in the foveal pit and macular area. Loewe's halo or ring represents the heaping of the fibers at the Fiber Layer of Henle.

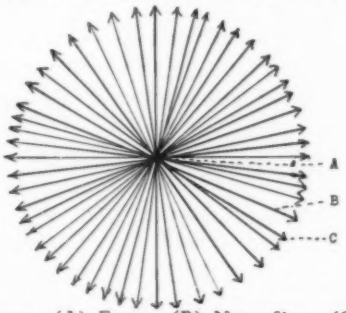
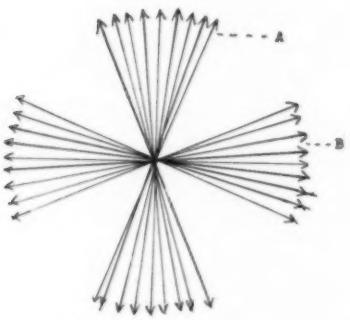


Fig. 1. Yellow spot. (A) Fovea. (B) Nerve fiber. (C) Loewe's Halo.

The nerve fibers are oriented in all possible directions, 360°. If now a polarizer is placed before the eye with the plane of transmission at 0 - 180, the result is as follows becoming the Haidinger Brush. (Figure 2.)

The brushes are seen larger when the sky is viewed and smaller when a nearer surface is viewed. If an illuminated surface is fixated at a specified distance, and the surface then approached, the brushes can be seen to become smaller varying directly as the distance separating viewer and screen. This size change is undoubtedly a size constancy phenomenon.

If the eye is uncorrected, regardless of the error, the brushes will be seen to be the same size. This fact is easily established by viewing



the brushes through any kind of lens, and by the reports of the aphakic cases. The eye corrected or uncorrected, aphakic, or normal, the brushes appeared the same size at the same distance. Therefore it holds true that the yellow spot or Haidinger Brushes can be seen regardless of any refractive error, provided the integrity of the macula is maintained and light can reach the retina.

Goldschmidt[4] conceived the idea of using the Haidinger Brush as a test to differentiate a macular pathology from amblyopia ex anopsia. If the macula or fovea has been injured or diseased, as in retro bulbar optic neuritis, then no amount of coaxing can ever elicit the Haidinger Brush, but if the eye does not see due to an amblyopia ex anopsia, then that eye will be able to see the Haidinger Brush. These brushes therefore can act as a screening test to estimate whether or not the eye can respond to visual training. Goldschmidt[4] designed an instrument which he presented in its embryonic stage before the New York Society for Clinical Ophthalmology in 1946. This instrument is now in the hands of The American Optical Company.

If the brushes are viewed through a polaroid lens rotating clockwise, then the brushes are seen to rotate clockwise. As has already been stated, the brushes do not rotate, but as the plane of polarization moves to the right, a different nerve fiber is polarized and now makes its impression creating an image. The stroboscopic effect is fast enough to appear as fusion and the object appears to move to the right. If now a sheet of cellophane is inserted between the eye and the polarizer, the brush will be seen to rotate counter-clockwise. This ability is not restricted to cellophane alone, but can be detected in other birefringent substances such as mica. There is little doubt that other materials can cause this reversal, but none has been investigated as yet.

If the brushes are viewed without the cobalt blue and the cello-

phane is inserted, it will be noted that the blue brushes became yellow and the yellow brushes blue, indicating that the plane of polarization has been reversed through 90°. The brushes will not snap 90° since there is a curious lag, but the effect is easily seen. The orientation of the cellophane enters into the problem if the brushes are standing still, but there is no need for orientation while the polaroid is rotating. Cellophane, it is known, has the inherent property of reversing the plane of polarization 180° and here we see in addition a change in 90°.

The result then is a mirror image which appears to move to the left while the plane of polarization moves to the right. If we represent the plane of polarization by a vector moving to the right, we can resolve this into two factors. Now the action of the cellophane causes a reversal of the 180th factor and the new resultant of the 90 and new 180 factor is a vector moving in the opposite direction. (Figure 3.) This rotation to the right appears through the cellophane

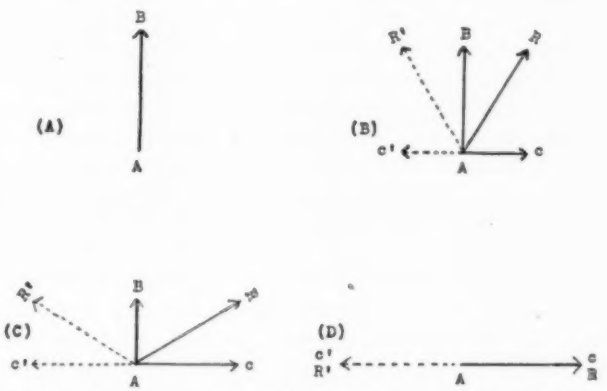
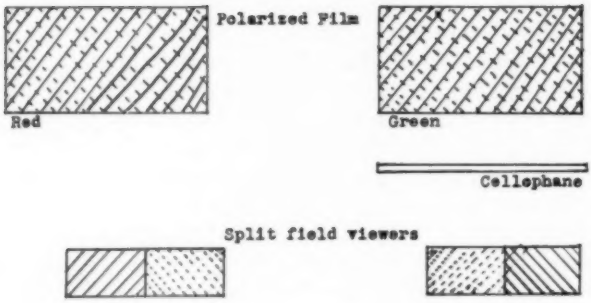


Fig. 2. Haidinger Brushes. (A) Yellow brush. (B) Blue brush.

to be a rotation to the left. This effect can be duplicated by orientating polaroid so that a clockwise rotating polaroid lens causes a wave of extinction to go in a clockwise or with direction. Upon insertion of the cellophane between the rotator and the polaroid, the motion changes to an against. Also, if two dichroic colors are viewed through a split field polarizer, and cellophane inserted between the two, the colors reverse their plane of polarization and are seen on the opposite portion of the split field. (Figure 4.)

If two thicknesses of cellophane are used, there is a double reversal or no effect, three thicknesses a reversal, and so on.



Conclusion:

1. The Haidinger Brushes are the residue of polarization and not the product.
2. The "yellow spot" is the origin of the Haidinger Brush.
3. The Haidinger Brushes are, therefore, a specialized entoptic image of the fovea, macula, and fiber layer of Henle.
4. The brushes can be seen by any eye provided that the integrity of the macula has been maintained and light can reach the macula.
5. Cellophane creates a mirror image of the Haidinger Brushes, causing an apparent reversal of the direction of the brush.
6. It is possible that this phenomenon of Haidinger Brushes may have a clinical use in providing a screening test prior to vision training for determining the integrity of the macula.

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HEADACHE: DIAGNOSIS AND TREATMENT*

Lester S. Blumenthal†
Washington, District of Columbia

Study of the headache problem has long been a favorite interest and actually a hobby of mine. I therefore welcome invitations to discuss this subject and am appreciative of the opportunity afforded me to address the District of Columbia Optometric Association.

It is a rare patient who can honestly say that he has never had a headache, and it is quite likely that the symptom of headache confronts the physician more frequently than any other. The lay person is so convinced that most headaches are due to eye strain, that the optometrist is usually the first to be consulted by a person with headache.

It therefore follows that you, in the field of optometry, must deal more often with headache problems than the average medical man who takes little or no interest in the subject. This very fact places you in the advantageous position of being able to help these unfortunate patients by correcting defects that fall within your field of therapy, or of referring the patient to one sincerely interested in the problem if you decide that the etiology lies outside the optical system itself.

If one should search for the human ill which has manifested itself most widely during all times and among all people, there can be but little doubt that headache would attain this unenviable distinction. Oliver Wendell Holmes has said that "if one wishes to show a student the difficulties of medical practice he should give him a headache to treat."

Headache is found as part of many conditions—functional as well as organic. Unfortunately, it is usually a purely subjective symptom so that its cause must be found not by gross physical examination but rather by careful and repeated questioning. Often testing with specific drugs for their effect on production or relief of a specific headache will help determine the character and mode of production.

Only in recent years have headaches been classified clearly as to cause, and their mechanisms clarified by Wolff's brilliant observations.[1A-E] A discussion of these mechanisms of production of headache will enable us to arrive at a working classification which will clarify the subject for us.

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†Physician (M.D.) in charge of the Headache Clinic at the George Washington Hospital, District of Columbia.

PATHO-PHYSIOLOGY OF HEADACHE

The experiments and controlled clinical observations by Wolff[1] and by others[2] have afforded us the following data in regard to production of pain about the head.

TABLE I

Structures sensitive to pain were found to be:

1. All the tissues covering the cranium, especially the arteries.
2. The great venous sinuses and venous tributaries from the surface of the brain.
3. Parts of the basal dura.
4. The dural and cerebral arteries at the base of the brain.
5. The fifth, ninth, and tenth cranial nerves and the upper three cervical nerves.

The skull, pia-arachnoid and brain parenchyma are insensitive to pain. Stimulation of pain-sensitive intracranial structures on or above the superior surface of the tentorium results in pain in front of a line drawn vertically from the ears across the top of the head, and the pathways are mediated through the fifth nerve. Pain behind this line results from stimulation of pain-sensitive structures on or below the inferior surface of the tentorium, and the pathways for this are contained in the ninth and tenth cranial nerves and the upper three cervical nerves.

After determining what tissues were pain-sensitive, it was then found that pain could be produced by several different methods.

TABLE II

The six basic mechanisms by which headache may arise from intracranial sources.

1. Traction and displacement of the longitudinal sinus and contributing veins.
2. Traction of the middle meningeal arteries.
3. Traction of the arteries of the circle of Willis and its branches.
4. Direct pressure on cranial nerves five, nine, and ten, and the upper three cervical nerves.
5. Inflammation in or about any of these structures.
6. Distention and dilatation of intracranial arteries.

TABLE III

Extracranial sources of headache.

1. Headache may arise from distention of arteries, chiefly branches of the external carotid.
2. From contraction and spasm of muscles of the scalp and neck. This latter mechanism may be associated with postural strain, reflexes from pain-sensitive nasal, paranasal and ocular structures, and especially with tension anxiety states.

In the experimental investigations of the intimate mechanisms of headache, particularly in the important group in which arterial dilatation has been found to play a decisive role, the use of histamine has been a potent weapon. Headaches produced by the intravenous injection of histamine have been found to duplicate those occurring in migraine, following head injury and in a group of patients suffering from headaches associated with psychoneuroses, fatigue, and various organic intracranial disorders. The ubiquitous action of histamine in mimicking such diverse types of headache suggests the possibility that many clinical

entities may lead to headache through the release of histamine or a histamine-like substance, which causes dilatation of intracranial arteries and consequent stimulation of pain-sensitive structures in or near their walls.

CLASSIFICATION OF HEADACHE

There have been numerous attempts at classifying headaches, none of which has been completely satisfactory. The most comprehensive classification is that of Horton[3] which, although quite accurate and complete, is too complicated for every day use. This classification covers four full pages in a standard-sized text book.

The following classification, which is believed to include the most important types of headache, and is based mainly on the etiology of the condition, has proved quite useful in my hands.

TABLE IV
Clinical Classification of Headache

1. Due to intracranial disease
   (a) Meningeal irritation (meningitis, subarachnoid hemorrhage)
   (b) Space-taking lesions (brain tumor, abscess, subdural hematoma)
   (c) Lumbar puncture headache
2. Psychogenic
   (a) Tension-anxiety
   (b) Conversion hysteria
3. Post-traumatic cerebral syndrome
4. Vascular
   (a) Migraine
   (b) Hypertensive
   (c) Histamine cephalalgia
   (d) Temporal arteritis
5. Neuralgia
   (a) Supra-orbital
   (b) Occipital-cervical
6. Associated with diseases of ocular, nasal and paranasal structures
7. Pyrexial and toxic

DIAGNOSIS

It is important to remember in the differential diagnosis of headache that a careful and detailed history and at least a superficial exploration of the patient's personality pattern are usually more helpful than the physical or neurologic examination, which are often entirely negative. The patient should be questioned as to the duration of the headache; the type of onset; whether sudden or gradual; the constancy or intermittency of the pain; its character, whether sharp, dull or throbbing; the influence on the headache of posture, weather, emotional tension; the presence or absence of accompanying ocular, nasal or gastrointestinal phenomena; whether it is predominantly diurnal or nocturnal. To the experienced observer the perfectionistic, worrisome migraine victim, the anxious, tremulous sufferer from a tension headache, and the

blandly histrionic hysteric will be readily identifiable. The social and economic background which make up the life situation of the patient will frequently offer a more cogent explanation of a headache than a battery of laboratory procedures. This does not rule out, of course, the necessity for a thorough and painstaking physical and neurologic examination which will be fruitful, especially in the case of focal or diffuse intracranial disease. Palpation of the temporal arteries and of the scalp and cervical musculature, and percussion of the skull and cervical vertebrae may be revealing. The important and significance of each of these factors will be well brought out below.

HEADACHE DUE TO INTRACRANIAL DISEASE

The meningeal headache, either acute or chronic, is due to direct inflammatory or mechanical irritation of the dural nerve endings in the neighborhood of the meningeal arteries and the sinuses. The pain is constant, more or less severe, and of a deep, steady, boring character. It is felt at the top or front of the head if the meninges of the convexity are chiefly involved, and in the occipital or cervical region with a principally basilar or subtentorial process. Treatment of the headache is symptomatic until the etiologic factor can be combated, as in the case of bacterial meningitis, or is gradually absorbed, as in spontaneous or traumatic subarachnoid hemorrhage.

The previously commonly accepted explanation ascribing the headache occurring with space-taking intracranial lesions to the effects of increased intracranial pressure is no longer tenable in view of the work of Kunkle, Ray and Wolff.[18] These workers have shown that artificial elevation of the intracranial pressure to abnormally high levels failed to produce headache in normal subjects, that in brain-tumor patients, headache was as commonly associated with normal as with increased pressure, and that headache could often be produced in this group by lowering the intracranial pressure but never by elevating it. Headache in space-taking lesions is produced by traction on intracranial pain-sensitive structures, chiefly the large arteries, veins and venous sinuses and certain cranial nerves.

The headache associated with brain tumor characteristically occurs as recurrent episodes of bursting pain usually worse in the morning and often associated with vomiting and evidences of localized neurologic dysfunction. In cases of brain tumor, the headache is of considerable localizing value. Especially in the absence of papilledema, it may overlie the site of the lesion. Occipital headache is almost always present with a posterior fossa mass. Paroxysmal headache suddenly appearing or disappearing with change of position of the head is characteristic of

tumors causing a ball-valve blocking of the foramen of Monro by a tumor in the third or lateral ventricles (Harris),[4] or in the fourth ventricle (Alpers and Yaskin).[5] The treatment of headaches of this type can be symptomatic only until the lesion responsible is eradicated.

Headache following lumbar puncture may be of two sorts. The nonspecific type occurs in sensitive or emotionally unstable individuals, especially those who are apprehensive about the procedure, or are the victims of misinformation about its effects. Except in the nature of its precipitating occasion, this headache is indistinguishable from some of the post-traumatic headaches in which psychogenic factors are paramount.

The other type of lumbar puncture headache is a drainage headache due to prolonged leakage of cerebrospinal fluid through the dural hole in the lumbar sac with resultant intracranial hypotension and consequent dilation of, and traction on, pain-sensitive intracranial vascular structures. The pain is throbbing in character, felt in the occipital region or back of the neck, and is often associated with nausea and vomiting. It occurs only in the upright position, is relieved by lying down, and never lasts longer than a week to 10 days after the puncture. This headache may be prevented by the replacement of the removed fluid with an equal amount of salt solution or hypotonic saline administered intravenously (Reese and Shulak).[6] The lumbar puncture headache may be relieved by the use of ergotamin tartrate (Guttman)[7] administered intramuscularly in doses of 0.25 to 0.50 mgm. and repeated as often as every 2 or 3 hours. Caffeine sodiobenzoate (0.5 gm. intravenously) and repeated at 4 to 6 hour intervals may also be beneficial. Nicotinic acid (25-100 mgm intravenously) sufficient to produce a moderate flushing reaction given twice daily has recently been found of considerable benefit.

PSYCHOGENIC HEADACHES

Psychogenic factors, either by themselves or in combination with more or less important organic etiologies, are undoubtedly responsible for most headaches. In many cases, as in the tension-anxiety and hysterical headaches to be described, it is obvious that emotional conflicts at various levels of expression are responsible for the symptoms. In other instances, notably the headaches of migraine and hypertension, constitutional or hereditary factors are inextricably entwined with the psychogenic. The post-traumatic headache is another example of this class, in which elements of functional and organic pathology are present in varying degrees in almost every case. Still a third category includes many headaches erroneously imputed to such causes as sinusitis, eye strain

or constipation, on the basis of insignificant findings.

In order to better understand the way in which unrelieved emotional conflict can produce head pain, it is desirable to divide the psychogenic headaches into two groups, the tension-anxiety and the conversion hysteria. The conversion hysteria represents an attempt on the part of the patient to relieve an emotional tension in a symbolic manner, while in the tension-anxiety the symptoms are not a substitute expression of the emotion but are the result of its normal physiologic concomitants, an anxiety equivalent. Thus, in the restless, dammed-up individual suffering from an anxiety state, part of the effect of his chronic emotional tension is to cause spasm and contraction of the cervical and scalp musculature, thus producing the usual tension-anxiety headache. In addition, the effects of tension, mediated over the vasomotor nerves, may have repercussions on the intracranial vascular structures in a manner similar to that described for the experimental histamine headache.

The therapy of the psychogenic headaches must be mainly psychologic, and to the extent that emotional factors enter into the genesis of other headaches, psychotherapy must have a corresponding importance.

POST TRAUMATIC CEREBRAL SYNDROME

The post-traumatic cerebral syndrome, characterized by the occurrence of headache, dizziness on change of position of the head, instability and personality changes, is a disease state of great frequency and almost equally great obscurity. Innumerable papers have been written attempting to prove that the symptoms are either predominantly organic or psychogenic. A trend away from this "either or" attitude is found in the excellent papers of Denny-Brown,[8] and of Symonds,[9] all of whom emphasize that physiogenic and psychogenic factors are closely interwoven in every case and that only by careful attention to the relative importance of each can the patient be properly treated.

The headaches which are the most prominent feature of the post-concussion syndrome cannot be satisfactorily explained by any single mechanism, and the various theories advanced are not entirely satisfactory. The fact that head injuries may be associated with damage to the fibrous, muscular, or skeletal tissue of the posterior cervical region is often overlooked. In these cases, trigger areas may be set up which are responsible for pain radiating forward over the head. If the case is one in which psychogenic factors are dominant, the mechanism of the headache will be that described for either the tension-anxiety or the hysterical type, depending on the basic personality of the patient and his manner of reacting to a traumatic situation.

The headache occurring in the post-traumatic cerebral syndrome may be of almost any description. A type frequently seen in cases in which physical factors are considerable is paroxysmal, lasting for a few hours or less. It is often unilateral or localized, although it may be generalized, and is made worse by exercise, excitement, and change of position. A history of antecedent head trauma and the presence of the other symptoms of the syndrome are necessary for diagnosis.

Much can be done to prevent the development of psychogenic post-traumatic symptoms by proper management during the acute stage of the injury. The physician should carefully avoid discussing the possibility of the development of sequelae, especially in emotionally unstable patients. Excessively prolonged bed rest is unnecessary, and by its ominous implications is psychologically dangerous. Graduated physical activity and postural exercises are useful at this stage.

After it has developed, the post-traumatic headache is sometime extraordinarily resistant to treatment and may continue for months or years, especially if compensation is being paid. Friedman and Brenner[10] have reported suggestively promising results in early cases with a single injection of 0.1 mgm of histamine intravenously. Courses of histamine "desensitization" by the intravenous and subcutaneous routes combined as described below, have resulted in satisfactory response in three cases recently treated by me. A combination of the cerebral vasoconstrictors, benzedrine, caffeine and ephedrine, is effective in a certain proportion of cases. Malone[11] has reported beneficial effects from prostigmine administered orally and parenterally.

In cases in which cervical injuries have occurred and trigger areas can be found, repeated infiltration with novocaine may serve to produce lasting relief. Psychotherapy of some type is indicated in most cases, and in many the major attack must be psychotherapeutic.

MIGRAINE

Migraine is an important and commonly occurring entity. The typical attack is preceded by the occurrence of visual phenomena, such as scotomata or field defects. It is followed in 15 or 20 minutes by a throbbing headache on one side of the head which lasts for hours to days, and is often associated with nausea and vomiting. The painful headache of migraine has been shown to be due to distention of cranial arteries, chiefly the branches of the external carotid artery and possibly the dural arteries, while the pre-headache visual phenomena are related to constriction of cerebral arteries.

The frequent familial occurrence of migraine suggests the importance of the hereditary and possibly of the constitutional factor in the

disorder. Certain similarities between migraine and epilepsy and the usually accepted dictum that the ancestries of migraine patients are heavily weighted with epileptics has led to the theory that there is a relationship between the two conditions. However, many authors dispute this, and electroencephalographic studies have been contradictory. That a small proportion of migraine sufferers have an allergic background or predisposition has long been known, and recently a relationship on an allergic basis between migraine and Meniere's syndrome has been postulated by Atkinson.[12] On the basis that the vascular mechanisms of migraine are precipitated by the release of histamine into the blood stream as the result of an allergic reaction, Butler and Thomas[13] have used histamine in the treatment of migraine in a manner which will be described.

Migraine tends to occur in individuals of a certain type of personality make-up which has been described as being indecisive, insecure, perfectionistic, compulsive, sensitive, anxious, and easily discouraged. In many respects migraine is akin to the psychoneuroses, and the importance of emotional conflicts and problems in the genesis of attacks cannot be overestimated.

The history of the therapeutic approach to the migraine problem shows that very few stones have been left untouched in attempts to control the malady. More emphasis is being placed on functional and emotional aspects and indeed many of these patients may receive relief by psychiatric treatment and release from nervous tension. It is well to attempt to ferret out each patient's difficulties and endeavor to teach him how to avoid strains and situations that will lead to the migraine attack. However, in spite of the above, many will continue to have the seizures, and other methods will have to be used.

In discussing the treatment of migraine we must distinguish between treatment of the individual attack and prophylaxis to avoid getting an attack. Most patients say they are more comfortable if, when they feel an attack coming on, they can lie down in a quiet, dark room and hold a cold towel tightly against the pulsating temporal artery on the affected side.

It often helps to take aspirin, empirin or sedatives. In this way many can weather the storm quite comfortably, but few actually reduce the duration of each attack. There are two more or less specific methods of treatment in use. One is inhalation of 100 per cent oxygen as first introduced by Alvarez and Malone.[14] Since 1926 we have had the ergotamine tartrate treatment which, if taken early in the attack, will often abort the attack or shorten it. However, many patients have un-

comfortable and even dangerous side effects from this. In spite of this, many continue to take it by hypodermic injection year after year.

Recently Horton, Peters and Blumenthal[15] have investigated a new ergot preparation, D. H. E. 45 (dihydroergotamine), which, when used hypodermically in the same dosage as gynergen (ergotamine) (0.5-1.0 mgm) works as well and has many less side reactions. There are no reports of effects on the uterus or an increase in blood pressure. We first reported our results in 1942.

In review of my more recent cases of typical migraine, I have summarized my results of treatment with dihydroergotamine in 51 patients.[16] These patients were treated during 266 individual attacks of migraine. In each case, dihydroergotamine was given subcutaneously in doses of 1 cc. (1 mgm.). On occasion it was found that optimal results were obtained if this same dose was repeated within several hours. In 93 per cent of the attacks, the results were excellent, in 1 per cent they were good, and in 6 per cent little or no relief was obtained.

We have also studied the effects of the new anti-histamine preparation, benadryl, on acute attacks of migraine headache.[17] Each patient was instructed to take 100 mgm. of benadryl orally at the onset of a headache and to repeat within four hours if necessary. Of the 11 patients treated in this manner, four reported marked relief, two moderate relief, and five little or no relief.

What can be done to prevent or reduce the incidence of these attacks? As stated above, everything under the sun has been tried. Occasionally, by elimination diets and by diaries we can determine that the patient is actually sensitive to certain types of food. Control of ovarian or thyroid dysfunction may control attacks. Some few patients may benefit by prevention of sodium and fluid retention. This is the case in certain women who have migraine with menstruation and who also may have an inordinate craving for salty and spicy foods. In those cases where all the indicated studies have been made and none of the above factors play a part, there are still other things that are often effective.

Hines and Eaton[18] found that approximately 80 per cent of their patients with migraine and increased blood pressure received partial or complete relief of headaches on potassium thiocyanate treatment if the blood levels were kept at 10 to 12 mgm. per cent. They then studied its effect on patients without elevated blood pressure and of these some 50 to 75 per cent obtained considerable relief.[19]

Methods of therapy based on the allergic hypothesis mentioned above have been advocated. Atkinson[20] uses nicotine acid starting with

6 to 8 intravenous injections of 20 to 30 mgm. and increasing by daily increments of 5 until he gives 50 mgm. This is followed by daily intramuscular injections supplemented by 50 to 100 mgm. orally.

Another promising approach to the problem is the treatment with histamine. There is considerable evidence to support the theory that migraine in many cases may be precipitated by the release of histamine into the blood stream in patients who have a lowered tolerance to the drug. The debate could go on at length as to where the histamine comes from and why and how it causes migraine. It must suffice at present to present the technique of administration and results of this treatment. Horton[21] first tried histamine, by subcutaneous desensitization as will be described later, with very little success in typical migraine. Since then he has had more success with prolonged intravenous administration of the drug combined with subcutaneous administration.[22] Butler and Thomas in May, 1945,[13] reported on the intravenous administration of histamine in 34 patients with migraine. They used 2.75 mgm. of histamine acid phosphate in 500 cc. of normal saline and administered it over a period of four to eight hours. Thirty-one patients obtained complete or considerable relief. I personally give the treatment for a one hour period in the office, daily or every other day, and have had very promising results to date.[23]

I have designed my treatment so that the patient may be treated as an ambulatory patient in the office. At the onset I give a daily continuous intravenous drip of histamine diphosphate (2.75 mgm. dissolved in 500 cc. normal saline) for four consecutive days. Each treatment is given for approximately one hour at a speed just fast enough to produce a slight flushed sensation about the head without causing uncomfortable side effects (5-15 drops per minute).

After the initial four days of treatment, the infusions are given three times a week until definite improvement takes place. In successful cases this often occurs at about the third or fourth week of treatment. At this stage subcutaneous administration of histamine as described by Horton[21] is instituted and the intravenous therapy is discontinued. I have found that future relapses may be prevented in many cases by having the patient continue his subcutaneous histamine indefinitely.[24]

HYPERTENSIVE HEADACHE

The usual or typical headache of essential hypertension, like the migrainous headache, is vascular in origin and has also been found to be associated with dilatation and stretching of the extracranial and, to a lesser degree, the dural arteries.

The similarity between the two conditions is emphasized by the fact

that migraine has been found to be five times as common in hypertension as in a group of controls, while a significant number of hypertensives have had migrainous headaches before the onset of their hypertension.[19]

Neither increased blood pressure[1C] nor increased spinal fluid pressure[25] is directly correlated with the occurrence of headaches in hypertensives, and drugs reducing blood pressure are not very successful in relieving the headache.

The typical hypertensive headache is dull or throbbing, often predominantly frontal or fronto-temporal, and is present on awakening, or awakens the patient in the early morning. Nausea and occasionally vomiting may be associated.

In the treatment of the typical hypertensive headache ergotamine tartrate and caffeine have been found to be useful, as might be expected from the similarity in mechanism to the headache of migraine. Steiner[26] has recently reported good results by the use of 10-inch blocks under the head of the patients' beds. Psychotherapeutic measures such as advice as to living habits are again an important element of a rounded treatment regime. Maintenance of a blood level of 8-12 mgm. per cent of potassium thiocyanate often controls recurrent hypertensive headaches.[18, 19] Many patients can obtain relief of severe headaches after undergoing lumbar sympathectomy.

The importance of histamine as a weapon in the experimental elucidation of many types of headaches has been mentioned. The headache produced by the intravenous injection of this substance is the result of mechanical stimulation of pain-sensitive structures in or near the walls or intracranial arteries caused by distention of the relaxed walls by blood driven in under increasing pressure. (Friedman, Brenner, and Merritt.)[27] It will be noted that this mechanism is similar to that operative in migraine and hypertensive headaches, except that in the case of histamine, the intracranial rather than the extracranial arteries are principally involved.

HISTAMINIC CEPHALALGIA

Not to be confused with the experimentally produced histamine headache is a clinical entity, the so-called histamine cephalalgia described first by Horton, MacLean and Craig.[28] This is a severe unilateral throbbing headache occurring usually in middle-aged individuals in attacks of an hour or less in duration, which characteristically occur at night and are associated with homolateral rhinorrhea, lachrymation, and sweating. They are made worse by lying down and by ingestion of alcohol, and are relieved in the erect position. In contrast with migraine headache, there is usually no family history, no relation to menses and

no associated scotomata, nausea or vomiting. In susceptible individuals, attacks can be easily precipitated by the subcutaneous or intravenous injection of 0.1-1.2 mgm. of histamine.

partial forms than in the full-blown syndrome, which is rather infre-

Histaminic cephalalgia is probably more common in incomplete or quent. I have treated only 21 classical cases in four and one-half years. During this same period of time, I have treated 400 typical cases of migraine. Since histamine is not an allergen, it is incorrect to speak of a sensitivity or an allergy to histamine. Certain individuals appear to have a lowered tolerance to histamine. Just how histamine in quantities large enough to cause symptoms is released into the circulation is conjectural. There may be something in the way of an allergic reaction in or upon the endothelial cells of vessel walls releasing histamine into the blood stream from within the cells (Spriggs).[29]

The decision as to whether histamine "desensitization" should be carried out in a given case is sometimes facilitated by observing the effects of an injection of histamine. If the specific headache complained of by the patient is reproduced it seems worthwhile to attempt this type of treatment regardless of the precise details of the headache. However, this cannot be considered an infallible test, and treatment has on occasion helped people with headaches not reproduced by the test dose. Treatment is by desensitization with histamine, and may be carried out by the subcutaneous method of Horton,[21] in which, after an initial dose of 0.25 cc., doses increasing to 0.05 cc. are given twice daily until 1 cc. has been reached. The intravenous method as described under the treatment of migraine often brings about a remission of the headaches more rapidly than does the subcutaneous injections. Once relief is obtained, however, it is wise to follow this up with the above-outlined subcutaneous injections. Graduated doses of prostigmine solution have also been used[30] as have the anti-histamine substances such as benadryl, pyribenzamine, etc. The antihistaminics would appear to be worth a trial, but only if the drug is given directly into the veins, which is not practical for the usual attack. Individual attacks may also be controlled by intravenous adrenalin (1:400,000 solution).

TEMPORAL ARTERITIS

Temporal arteritis is a rare disease in which unilateral or bilateral temporal headaches are associated with fever, weakness, anorexia, weight loss, anemia, mild leukocytosis, and the finding of painful tender areas over the scalp and along the course of the temporal vessels. It appears to be a localized arteritis and periarteritis of unknown cause with systemic evidences of infection. There is some resemblance to periarteritis

nodosa, but temporal arteritis is self-limited and localized and is a less serious condition. It usually occurs in older people past 60 years of age. Shannon and Solomon have reported a case in which bilateral temporal arteritis was associated with complete loss of vision. Protas and Saidman[32] reported this complication in nine of 34 cases. Meade, Blumenthal and Holmes[33] have recently reported another case resulting in complete blindness. The mechanisms of the pain here is inflammatory irritation of the temporal arteries and periarterial tissues. Bowers has advocated the use of large doses of thiamin chloride in the treatment, but resection of a small segment of the involved artery is usually necessary for relief. In one recent case[33] extensive intravenous histamine therapy was tried without significant benefit. Horton's recent work[22] seems to indicate, however, that further trial of histamine in temporal arteritis is warranted.

NEURALGIAS

The neuralgias invade the domain of headache only incidentally. Whereas they are a potent source of facial pain, they infrequently cause pain in and about the head. The two varieties whose manifestations are cranial are the supraorbital and the occipital neuralgias. The former, which may be considered as a subvariety of trigeminal tic, is felt in the distribution of the supraorbital nerve, and the latter involves various posterior cervical nerve trunks, notably the greater occipital. Although actually uncommon as a cause of head pain, the diagnosis of neuralgia is frequently loosely made both by patients who consider almost any type of recurrent pain as a "neuralgia" and by physicians who fail to analyze the character of the pain and its anatomic distribution.

The mechanism of neuralgic pain is poorly understood. Without much supporting evidence, it has been ascribed to pressure on nerves or roots or to hypothetical local changes in the vasa nervorum. Recent work has tended to emphasize the primarily vascular origin of the pain of neuralgia. In a group of patients with trigeminal neuralgia in whom stimulation of trigger points regularly produced paroxysmal pain, Karl, Peabody and Wolff[34] were able to largely eliminate this pain by the administration of vasodilator agents, notably nicotinic acid. They postulated that the pain was the effect of stimuli arising from the trigger area and evoking reflex vasoconstriction involving the trigeminal structures. In discussing a typical facial neuralgia, Fay[35] has also emphasized the role of vascular mechanisms.

The pain of neuralgia is characteristically sudden, violent and paroxysmal, usually lasting for a matter of seconds, and is described by the patient as tearing, knife-like or stabbing. The attacks can often be

precipitated by pressure on a trigger area, at the supraorbital foramen in the case of supraorbital neuralgia, and in the lateral neck region in occipital neuralgia. In the former condition, the pain is felt in the supraorbital and frontal region, and in the latter it is experienced in the occipital area with frequent radiation forward to the temple and forehead. There are no objective neurologic findings, and the patient has no complaints between attacks except that occipital neuralgia may be associated with disease of the cervical vertebrae or fibrous structures.

In the treatment of these conditions, medicinal remedies should first be tried, then injections of novocaine and alcohol into the nerve and finally surgery if no relief is obtained. The use of nicotinic acid (200 mgm. every 4 hours) has been mentioned. Particularly in the supraorbital variety, trichlorethylene, 30 minims inhaled very strongly at hourly or two-hourly intervals with the patient reclining, should be tried, and Davidoff has reported successful results with the use of large doses of ferrous carbonate. Repeated novocaine infiltration of trigger areas will sometimes break up a vicious cycle and produce cessation of symptoms. Alcohol injections are more likely to bring about prolonged relief, but should be used cautiously. In the case of occipital neuralgia, any lesions of the cervical vertebrae or musculo-fibrous tissues should be treated, and heat and light massage may be of some aid. If the pains persist in spite of these methods and are severe enough in intensity, surgical measures will have to be undertaken.

DISEASES OF OCULAR, NASAL, AND PARANASAL STRUCTURES

There is no doubt that diseases and disorders of the eyes, nose and sinuses are responsible for many headaches. It is also certainly true that in many cases head pain is falsely imputed to non-existent or unimportant abnormalities of these structures, and that the eyes and sinuses have been held responsible for headaches actually due to other factors. In cases in which the ocular or nasal structures are actually culpable, adequate examination by a specialist in the respective fields will usually reveal without difficulty the structural or functional pathology at fault. When such a cause cannot be found by appropriate methods, and especially when the usually employed remedial measures fail to bring relief, it is time to extend the search to extraocular and extranasal fields and especially to look into the special personality problems and life situation of the patient. In the practice of Davison,[36] 36 per cent of his adult patients have primarily functional disorders and in an additional 22 per cent the functional element is of importance. Proetz[37] mentions that only five per cent of patients with headache suffer from sinusitis.

In the case of headaches of ocular origin, the pain is caused either

by irritation of the conjunctival sac, increased intraocular pressure, traction on, or irritation of, the tissues of the iris, or imbalance of the extraocular muscles. These mechanisms may be associated with such clinical conditions as errors of refraction and glaucoma.

It should be mentioned that the ubiquitous "eye strain" often blamed for headaches is a somewhat fictitious entity, and that in the absence of the above abnormalities even prolonged use of the eyes will not cause headache. Ocular headaches, which may vary in intensity from the mildly annoying to the fulminating pain of glaucoma, are felt in and about the eyes, are referred to the distribution of the first division of the trigeminal nerve, and often radiate around the head to the occiput because of induced irritability and tension on the muscles of the scalp and neck. The treatment of headaches of ocular origin is that of the responsible condition.

Headache originating from disease of the nasal structures and paranasal sinuses is due to inflammatory or mechanical involvement of the turbinates, ostia, nasofrontal ducts, and superior nasal spaces. It has been found that the mucosa lining the sinuses is of relatively low sensitivity, while that lining the approaches to the sinuses is more sensitive to pain. Nasal and sinus headache is dull, deep, aching and nonpulsatile in quality. It is felt usually in the frontal and maxillary regions and less often in the occipital region, when it is caused, as in the case of eye headache, by secondary contractions of scalp and neck muscles. The pain of sinus headache seldom becomes as severe as that occurring in febrile states or in migraine. It is characteristically more severe in the morning, diminishing later in the day, except for maxillary sinusitis, in which the pain often begins in the early afternoon and is relieved by recumbency.

Pain of nasal or sinus origin will usually respond promptly, if at times only temporarily, to appropriate rhinologic treatment. If a so-called sinus headache is not promptly relieved by cocaine shrinkage or antral puncture, the question of its etiology should be reopened. Anesthetization of the ganglion should relieve the pain of sphenopalatine neuralgia in genuine cases of this somewhat vague syndrome.

Pain due to poor articulation of the temporomandibular joint has been described by Costen[38] and is localized in the vertex and occiput and behind the ears. It may be diagnosed by the presence of malocclusion, by tenderness to internal and external palpation of the joint, and by x-ray examination.

PYREXIAL AND TOXIC HEADACHE

The headache which is a common concomitant of fever or of sepsis

or toxic conditions in general has been shown by Sutherland and Wolff[1C] to be similar in mechanism to the experimentally induced histamine headache, and to be caused by dilatation of the large intracranial arteries. This headache may be pulsating or dull, deep and aching. It is generalized and is made worse by bodily movement and by coughing. It is relieved by antipyretics and analgesics and disappears with the cure of the underlying disease.

CONCLUSION

The several conditions discussed make up the bulk of cases of headache that one sees in medical practice. It is acknowledged that there will be many cases that do not fit into any of the above groups, but if one tries to properly classify each case, his therapeutic task will be greatly simplified. Once the diagnosis is made, let us approach the problem of treatment with increasing optimism and we shall be rewarded by encouraging results.

1601 ARGONNE PL., N. W.
WASHINGTON, D. C.

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ABSTRACTS

SKIAMETRIC DETERMINATION OF THE NEAR-POINT PRESCRIPTION. G. A. Fry. The Optometric Weekly. 1469-1472. October 5, 1950.

This paper reviews and comments upon various dynamic skiametric techniques. Included are: Sheard's Method, Treleaven's Method, Pascal's Method and Nott's Method.

R. E. B.

EXPERIMENTAL STUDIES OF FATIGUE OF ACCOMMODATION. C. Berens and S. B. Sells. American Journal of Ophthalmology. 33. 1. 47-58. 1950.

The authors summarize the results of their previous investigations (Arch. Ophth., 31, 148-159, Feb. 1944) and report on more recent work which they have completed on this subject.

Following a detailed examination of the results of their experiments, the authors list the following as the principal contributions:

(1) Demonstration of statistically adequate evidence of a mean decrement of slightly more than 1 diopter in near point of accommodation following ergograph exercise for a group of 57 asthenopes.

(2) Presentation of a reliable statistical basis for the development of a clinical test of ocular fatigue.

(3) The elimination of refractive error, age, accommodative power, muscle balance (lateral phoria), and decrement as casual factors related to fatigue of accommodation.

(4) The tendency of ergograph exercise to affect lateral phorias by increasing the original phoria.

The authors conclude that there is no satisfactory explanation of individual differences in accommodative fatigue for the class of patients studied. They suggest the possibility of psychological factors and urge that their findings be studied in the field of "psychosomatic ophthalmology."

R. E. B.

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COMPULSORY HEALTH INSURANCE SIDETRACKED

One result of the November elections is to postpone for some time action on the Ewing legislation for compulsory health insurance, one of the major parts of President Truman's Fair Deal program. From the optometric viewpoint this delay is probably good, as compulsory health insurance as proposed was not too well thought out and certainly did not fit into the accepted forms of democratic principles which have guided American life for generations. Many believe the needed job can be done in other ways.

It is true that a number of militant liberal minority groups supported the President's Fair Deal proposals, including compulsory health insurance. But that step was apparently more than most voters could take at this time. The election results indicated among other things a

decided hesitancy towards this type of federal control of matters affecting our everyday lives.

The question is not settled, however, as many lusty left wingers will continue to vocalize on the blessings of an all out welfare state in which no responsibility is left to the individual.

In retrospect, it is probably well that the vote came out as it did. There is some question whether optometry was prepared for the major changes which would have been necessary had the plan for compulsory health insurance been put into effect in the relatively near future. Furthermore, the question of eye care does not revolve entirely around optometry or whether or not it is prepared. The problem is broader than this and includes the overall ability of optometry and ophthalmology, aided by opticianry, to cope with the problems which would be immediately presented in the event of a compulsory health insurance program embracing eye care.

Certainly we in optometry must realize that if compulsory health insurance becomes a reality that optometry will be called upon to do its share, but only in conjunction with both ophthalmology and opticianry. Administration leaders and the public will expect a well integrated program of eye care requiring the closest and most harmonious relationships between the three groups which are to do the work.

Certainly today no one at all conversant with the overall picture of eye care would say that the three groups now furnishing this care in the United States are working as closely together as is justified in the public's best interest. This being true, the breathing spell brought about by the election results should be used to play down past animosities between the groups and to build anew on the firmer foundation of mutual respect a structure in which optometry, ophthalmology and opticianry all serve the public in an atmosphere of harmony and professional efficiency.

Opinion moulders and professional leaders of the groups now serving in the eye field are prepared to take the necessary steps toward bettering these working relationships and thus the service supplied the public by optometrists, ophthalmologists and opticians.

Optometrists everywhere should welcome this opportunity to improve interprofessional relationships to the end that the quality of service supplied by them continues to advance and that they can properly play their part in whatever plans or programs the future may hold in store for us as a profession.

CAREL C. KOCH.

SEASON'S GREETINGS

At the close of our 27th year of publication, the staff and editorial council of the Journal wish to express to the thousands of subscribers the heartiest Season's Greeting and their wishes for a pleasant and successful 1951.

CURRENT COMMENTS

Virginia Huck
Editorial Assistant

Optometrists will confer a favor by sending news items of general interest for this department; such as relate to new instruments, clinical techniques, education, visual health and optometric legislation and organization.

NOTES ON FUTURE ISSUES

In our February, March and April, 1951 issues we will present a manuscript by Gordon Lynn Walls. Professor Walls is a faculty member of the University of California, School of Optometry. His paper deals with the question of learning to see. The author explores this subject thoroughly and comes to conclusions which will have profound bearing on optometry's attitude towards this widely agitated question.

Because this paper will be discussed by optometrists everywhere I will give you a few short notes on Dr. Walls' background. He received his B.S. at Tufts College, 1926. His A.M. (Zoöl.) at Harvard, 1928, and his Sc.D. (Zoöl.) at the University of Michigan, 1931. His career has been devoted entirely to research and teaching. He has served as a staff member of the Scientific Bureau of Bausch & Lomb Optical Company, Rochester, New York, and now is a member of the faculty of the School of Optometry, Berkeley. He is a Fellow of the American Academy of Optometry.

Those members of our staff and Editorial Council who have read this important paper are enthusiastic over its publication. I hope all of our readers give it the attention it deserves.

In our January 1951 issue, Hofstetter, Stein and Graham of the Los Angeles College of Optometry review a research study made of the effect of absorbing filters on the discernibility of a television test pattern. Their findings deal with a timely topic and should assist optometrists in advising patients with real or supposed TV symptoms.

Morgan and Peters, in the same issue present a paper on the value of accommodative-convergence findings in presbyopic patients and how these findings correlate with those of non-presbyopic patients. This

faculty study was made at the School of Optometry, University of California.

The January issue will also present the results of a study on the clinical significance of the abduction findings by Kratz, a faculty member from Pennsylvania State College of Optometry, and chairman of the orthoptic section of the Academy. The same issue will carry a report on findings dealing with visual skills of school children following summer vacation. This material is presented by Kephart and Mazzoni of the faculty at Purdue.

In our January issue we will also present a paper on industrial medicine. This material by Johnson is a continuation of the series on occupational optometry which started last spring and which will run throughout most of our 1951 issues. Dr. J. J. Johnson (M.D.) is a specialist in industrial medicine and is plant physician for General Motors. Dr. John R. Wittekind is optometric consultant at the same plant.

In our January issue the writer will also review the highlights of the annual meeting of the Academy at Chicago in December and present significant actions which were taken.

MINORITY LEADER TO SPEAK

Although socialized medicine is now an accepted fact in the British Isles, the program still has its strong critics. Chief among these in optometric circles is J. Ross-Mansell,* who plans to visit the United States in April. At his suggestion, we mentioned his trip last October and indicated he would accept bookings for a few talks before optometric groups during his three-week stay in the States.

This announcement has brought three sharp protests—one from one of our well known and respected Pacific Coast educators, who denounces the Journal for giving aid and comfort to the enemies of compulsory health insurance as proposed for this country. In addition, we have received letters from two top British optometrists. These men advise us that British optometry has in large part accepted the principle of socialized health care, and they point out also that J. Ross-Mansell speaks only for a small minority group among the organized optometrists of Great Britain.

Perhaps it should be pointed out here that the proposed Ross-Mansell lectures in the United States are not sponsored by any group, but that in keeping with American tradition, a minority leader has the privilege of being heard, and we are sure American optometrists will listen with respect to him—whether they follow his advice or forget it.

*202 Station Road, Edgware, Middlesex, England.

NEW DRIVERS' TESTING EQUIPMENT OUT

New, American Automobile Association endorsed, portable equipment for testing drivers is on the market. The five-test device can be used to check field of vision, color vision, distance judgment, visual acuity and foot reaction time. A thorough job of giving these five tests can be completed in less than 10 minutes, according to Earl Allgaier, A. A. A. driver training department. During the testing, the driver and examiner are seated in one location.

WATCH THOSE SPOT ANNOUNCEMENTS!

Our compliments go to optometric groups spending sizable sums of their budgets toward public relations—and we notice the amount is increasing for many organizations. There is a constant need for better public relations between professional and lay people.

A word of warning, too, however. In listening to radio spot announcements, for example, we notice how easy it would be for the public to interpret the announcement as "advertising" by some optometrist. For proof, we offer the fact that several phone calls were received after such spot announcements as "Better Vision Through Optometry," asking if there was an "advertising" campaign currently being sponsored by optometrists.

We've convinced the public, for the most part, that advertising is unethical—now we've got to be careful they don't misinterpret well-intended public relations efforts.

NEW OPTOMETRY COLLEGE TO OPEN

The eleventh optometric college in the United States will open in September, 1951. This announcement was made by Dr. W. W. Kemmerer, acting president of the University of Houston, where the college will be located. The news was first broken in the *Journal of the Texas Optometric Association*. According to the Journal, the new college will award a Bachelor of Science degree at the end of four years study and a Doctor of Optometry degree in five years.

A planning committee, appointed by Dr. Ira Woods, Littlefield, is now working on administrative and organizational problems. Members of the committee are Dr. Nelson Greeman, Sr., San Antonio, chairman; Dr. Charles C. Murray, Jr., Lufkin; Dr. Bernard Mazow and Dr. W. L. Cheatham, Jr., Houston; Dr. Weston A. Petty, Lubbock, and Dr. Arthur J. Harris, Dallas.

NEWS BRIEFS

June 24 - 27 are the dates for the 1951 A. O. A. Congress, the Roosevelt, the New Orleans Hotel chosen for headquarters. . . . . Now

in production at Bausch & Lomb Optical Company are special eyeglasses for television fans, designed to reduce glare and minimize eye fatigue. . . . . Miss Annie Orfanos, librarian at Northern Illinois College of Optometry is planning to analyze and classify material published by the American Academy of Optometry. The project will be part of a more ambitious plan to compile a comprehensive index of optometric literature. Miss Orfanos was recently elected secretary-treasurer of the Illinois Chapter, Special Libraries Association, for the coming year. . . . . Los Angeles College of Optometry now has a Speakers' Bureau in conjunction with its school visual survey program. Students in their internship year are working in teams to explain the program. One speaks, one runs the projector of a documentary film. . . . . Temple University will hold its Eighth Annual Reading Clinic January 29 - February 2, 1951. This is the first of a long range, three-year program on remedial, corrective and developmental reading, designed to aid all engaged in solving reading problems. Enrollment is limited by advance registration. Contact Dr. Emmett A. Betts, Director, Reading Clinic, Temple University, Philadelphia 22, for registration and other information. . . . . Hard working New Jersey Optometric Association members took stock recently of progress in their state and found four major 1950 developments in addition to the recent Supreme Court decision favoring professional optometry. Achievements include endorsement of the school children's vision program by the State Blind Committee of the Lions Clubs of New Jersey; establishment of the school children's vision program in 80 parochial schools in an eight-county area; arrangements for the New Jersey State Board of Child Welfare to use optometrists, and appointment of Dr. Earl H. Ridgeway by Governor Driscoll to represent New Jersey at the Mid-Century White House Conference being held this month. . . . . Continental's Crestline sales continue to mount, reports Mrs. Katherine Cleaver, advertising manager, on the first anniversary of the gold filled frame. . . . . Two important Texas meetings are coming up in February. The Southwestern Congress of Optometry is scheduled for Fort Worth, Hotel Texas, February 12 - 14. Same town, same hotel for the Southwestern Visual Training Assistants meeting February 10 and 11. . . . . No longer will optometry schools and colleges be listed under "trade schools" in the next edition of "Patterson's American Educational Directory." Through the work of Dr. Elmer Soles A. O. A. public information department optometric colleges will be properly listed from now on under "professional schools." . . . . The ophthalmic optics department of Los Angeles City College came in for special mention

in a recent article in the *Los Angeles School Journal*, October 25 issue. Seven L. A. junior colleges were mentioned in an article captioned "The Junior College and the Community in Partnership." The College was praised for its work in strengthening community cooperation. . . . . Another Los Angeles news item: Dr. Henry Hofstetter authored an article, "Education in Optometry," in the official publication of the Federal Security Agency, Higher Education, October 1, issue. Dr. Hofstetter gives a complete review of the educational history of optometry, tracing development from 1300 to the present.

25 MILLION REFRACTIONS A YEAR

In the lead article of the October, 1950, *British Journal of Physiological Optics*, G. H. Giles, secretary of the British Optical Association, presents a review of material dealing with the distribution of visual defects. This review was originally given by Giles as the Owen Aves Memorial lecture before the Yorkshire Optical Society in May of this year.

In that portion of the paper dealing with the overall correction of refractive errors Giles comes to the conclusion that of the 48,000,000 persons in Great Britain, 23,460,000 require glasses. Of these, 13,000,000 are presbyopes; 3,000,000 are myopes; 620,000 have strabismus; 4,440,000 have hyperopia and astigmatism affecting visual acuity, while the remainder (2,400,000) have normal vision but are asthenopic due to uncorrected astigmatism, hyperopia, imbalances of the accommodative-convergence relationships or other ocular causes.

The author estimates that of the 23,460,000 persons in the above group, one-third will have their eyes examined each year, and that consequently about 7,820,000 eye examinations will be performed in the British Isles annually.

On this same basis we figure that optometrists and ophthalmologists in the United States should refract approximately 25,000,000 persons each year. This would be the equivalent of one person in six, based on 1950 census figures of 150,000,000 present population.

It would be interesting to know if we *are* refracting that number of patients? There are about 25,000 refractionists in the U. S. A., so according to the above estimation, each should, on the average, refract 1,000 patients each year.

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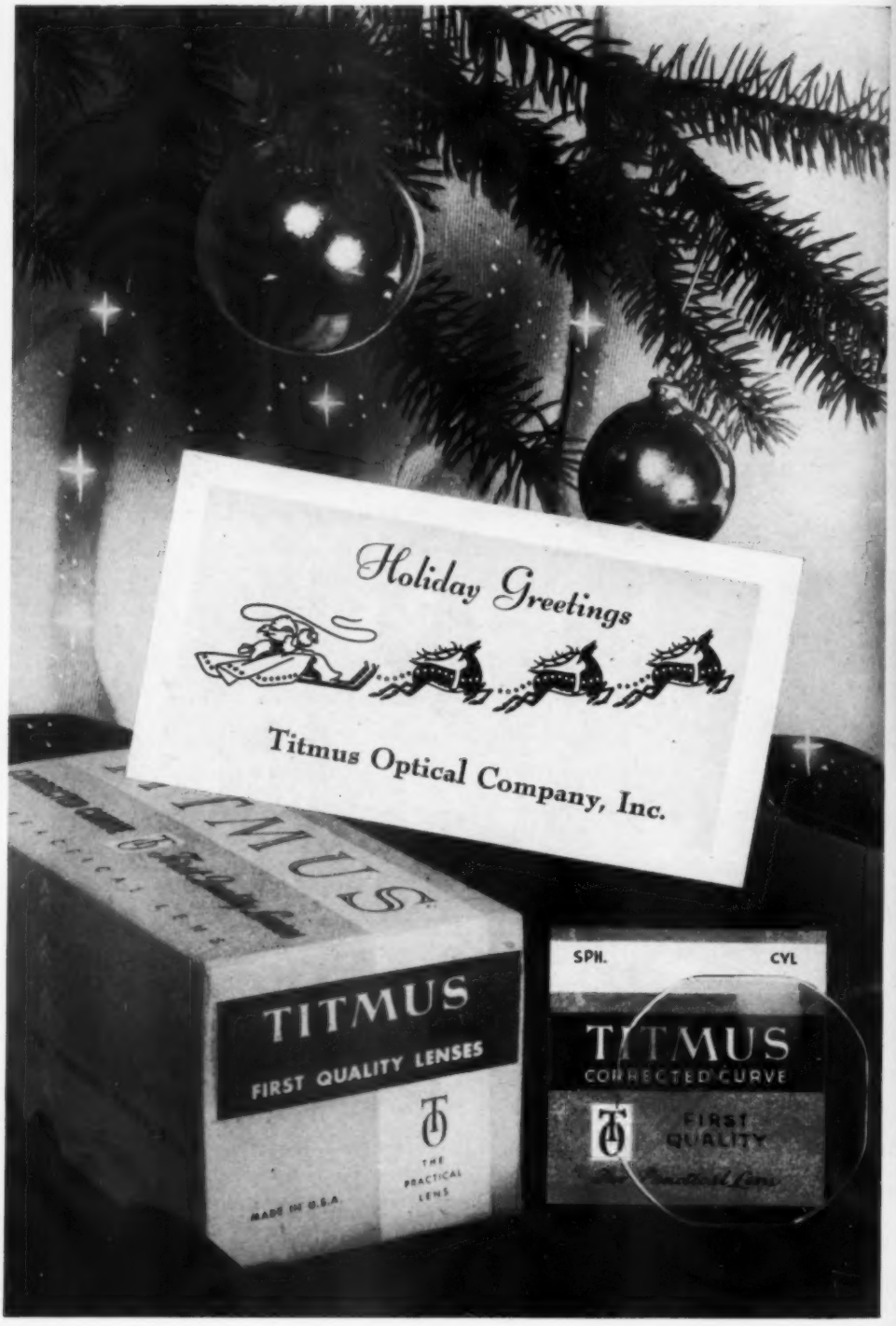
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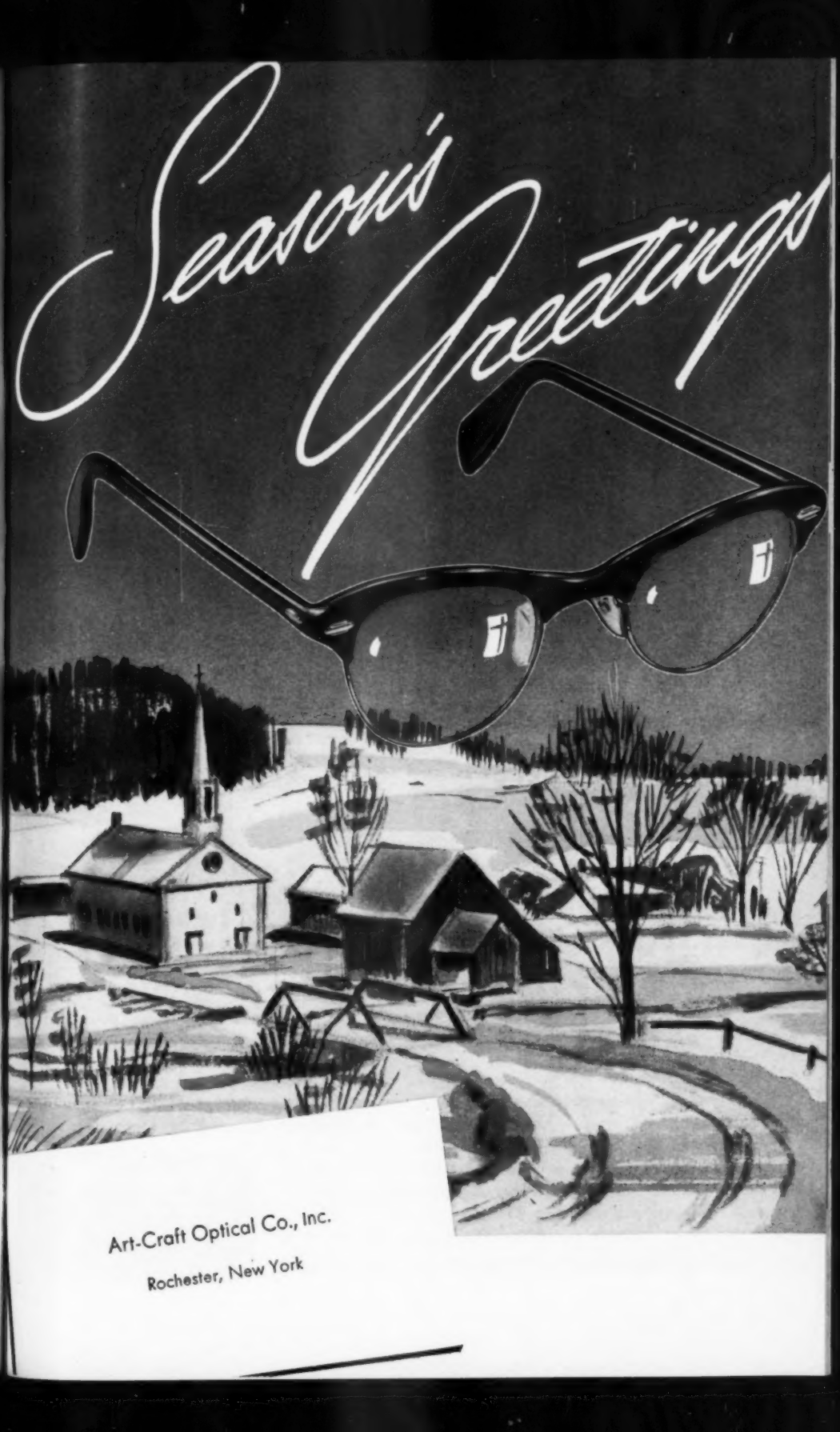

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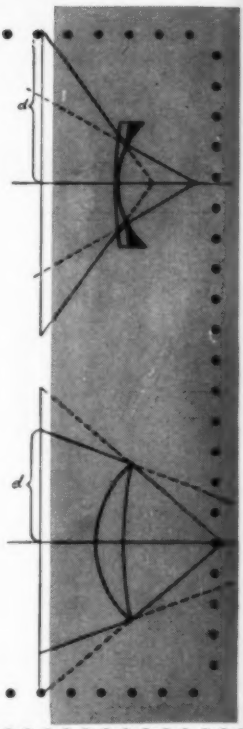

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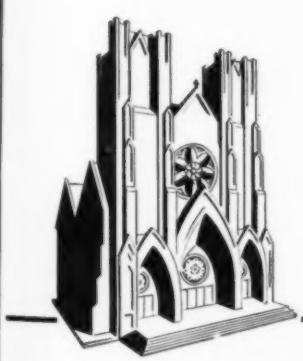

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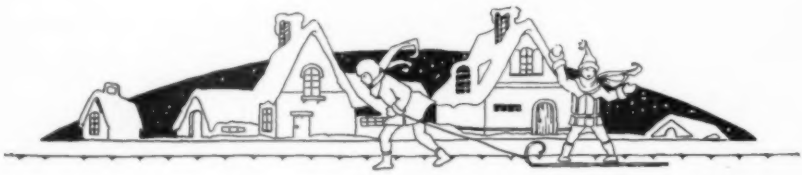

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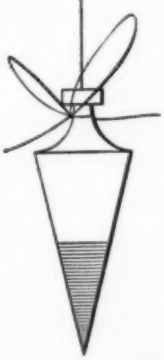

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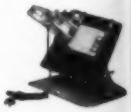

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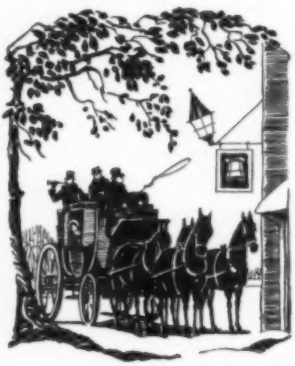

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